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Procedia - Social and Behavioral Sciences 46 (2012) 2635 – 2642

Procedia
Social and Behavioral Sciences

WCES 2012

Pre-service teachers' epistemological beliefs and approaches to learning

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Abstract

This quantitative study sets out to explore the beliefs students hold about knowledge and learning and the ways they approach their learning. Participants were 632 pre-service teachers at Faculty of Education. Turkish version of Schommer's Epistemological Belief Questionnaire (EBQ) and Turkish version of Biggs' Revised Two Factor Learning Approaches Scale (R-SPQ-2F) were used as data collection tool. One of the results shows that students who believe that learning depends on innate ability were likely to be surface motivated and utilise a surface strategy in their studying while students who believe in learning depends on effort would be deep-motivated and adopt a deep study strategy.

Keywords: Epistemological beliefs, Learning Approaches and Strategies, Teacher Education

1. Introduction

It is a common notion that students' characteristics, e.g. beliefs, conceptions of learning and motivation influence the learning process and learning outcomes or achievement. Studies of learning strategies show an important interplay of the cognitive, affective and metacognitive components in students' self-regulated learning (Vermunt, 1989). Students' belief in abilities and learning is also found to be an influential element of motivation and achievement (Dweck & Leggett, 1988). That's why, the relation of students' learning approaches and the study of epistemological beliefs has become one of the current research topics.

Students' Approaches to Learning

Students' motivation to learn and learning processes are always the major concerns of school teachers and college professors. Since the late 1970s, numerous studies have been conducted on student learning approaches and strategies. In general, two approaches or strategies to learning can be identified, the deep approaches and the surface approaches (Marton & Saljö, 1976; Entwistle et al., 2001). While the former usually indicates an attempt to maximise understanding, and the use of strategies focused on the meaning of the materials to be learned, the latter indicates an attempt to reproduce those materials to meet the minimum requirements, and the use of rote learning strategies. The learning approach adopted by a student influences how he/ she acquires and integrates knowledge

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1877-0428 doi:10.1016/j.sbspro.2012.05.538

and experience from the course or curriculum. This is particularly significant for teacher education students, who are learning how to teach and might reflect this practice in classroom teaching and learning. Researchers have found an association between the study approaches of students and the teacher's instructional processes (Campbell *et al.*, 1996; McKay & Kember, 1997). Besides conceptions about learning and strategies in learning, other cognitive and affective factors, such as students' beliefs and self-concepts have also been found to be influential determinants of students' learning (Hau, & Salili, 1996). One area of beliefs research that has received increasing interest in the late 1990s is epistemological beliefs and the influence of students' epistemological beliefs on learning.

Epistemological beliefs

Epistemology basic is a branch of philosophy that investigates the origin, nature, methods, and limits of human knowledge. Such beliefs influence the development of knowledge because they are considered to be the central values or theories that are functionally connected to most other beliefs and knowledge (Hofer & Pintrich, 1997). Perry (1970) hypothesized that students go through fixed stages attached to the development of epistemological belief: (a) dualism, (b) multiplism, (c) relativism, and (d) commitment. Expanding on the work of Perry, Schommer (1994) identified four dimensions within four perspectives of epistemological beliefs, ranging from naive to sophisticated. Sophisticated learners may believe that a vast amount of knowledge is evolving, some knowledge is yet to be discovered, and a very small amount of knowledge is unchanging. On the contrary, naive learners may believe that a vast amount of information is certain, some knowledge is yet to be discovered, and a very small amount of knowledge is changing. Epistemological beliefs influence our motivational beliefs, such as our effective use of learning strategies, academic performance, engagement, and persistence behaviors in self-regulatory and achievement oriented processes as shown by different studies (Shell & Husman, 2008; Schommer, 1990, 1994, 1998; Schommer, Mau, Brookhart, & Hutter, 2000; Qian & Alvermann, 2000). Pre-service teachers' epistemological beliefs are often not addressed within teacher education programs (Nespor, 1987). There is growing evidence to suggest that it is important to consider pre-service teachers' epistemological beliefs since such beliefs will influence how we approach, design, and delivery our classes. (Lawrence, 1992). Studies in epistemological beliefs provide one lens through which the teaching-learning process in teacher education can be viewed.

Relationship between Study approaches and epistemological Beliefs

King & Kitchener (1994) found that an individual who has more sophisticated epistemological beliefs have a better understanding of an issue on the basis of the available evidence, and is more likely to believe that alternative solutions may be constructed to solve problems. Learners with naive epistemological beliefs usually act as passive receivers of knowledge. Those with sophisticated beliefs are able to relate to experts on a more level plane, and they are also more likely to assume that knowledge comes from empirical evidence and reason as well as activities that they themselves are capable of pursuing (Schommer-Aikins, 2004). Chan & Elliott (2004) found that there was a possible influence of the epistemological beliefs on the conceptions about learning. Sheppard& Gilbert (1991) stated that the development of learners' epistemological beliefs is influenced by the teacher's theories of teaching and the learners' perceptions of the learning approaches. Together these studies suggest a relationship between students' epistemological beliefs and conceptions of learning, associating sophisticated beliefs with reflective abilities, and naive beliefs with passive learning. Understanding a learner's conceptions of learning is crucial for the teacher to identify effective teaching strategies if the learner is having difficulties in learning. When applied to teacher education, understanding pre-service teachers' epistemological beliefs and conceptions of teaching as well as the relationship between them enlightens teacher educators' review of the impact of their instructional approaches.

2. Purpose of the study

Studies exemplifying the relationship of epistemological beliefs and study approaches are still scarce, particularly in non-Western cultural contexts, resulting in a great demand for such studies. This study attempts to examine the relation between epistemological beliefs and study approaches adopted by a group of Turkish teacher education students. Specifically, this article addresses the following questions:

1. What are the characteristics of the epistemological beliefs and study approaches held by the Turkish pre-service teachers?
2. Are there any significant differences in epistemological beliefs and study approaches of the students under study in terms of gender, the level of students and the department they attend?
3. In what way are epistemological beliefs and study approaches of the Turkish pre-service teachers related?

3. Method

Participants

The participants consisted of 632 teacher education students at Faculty of Education, Kocaeli University. Of the participants, 487 were female (77.1 per cent) and 144 were male (22.8 per cent). Of the participants 98 (15.5 per cent) were from primary school teaching, 144 (22.8 per cent) were from mathematics teaching, 120 (19 percent) were from science teaching, 120 (19 percent) were from English language teaching (ELT), 70 (11.1 percent) were from pre-school teaching, 80 (12.7 percent) were from Turkish language teaching. Of the students 193 (30.5) were 1st year, 151 (23.9 percent) were 2nd year, 146 (23.1 percent) were 3rd year and 142 (22,5 percent) were 4th year students.

Data Collection tools

Two instruments were used in the study: The first one was a thirty five-item- questionnaire on a five-point Likert scale (1, strongly disagree, to 5, strongly agree) translated and adapted into Turkish by Deryakulu &Büyüköztürk (2002) from Schommer's sixty-three-item epistemological beliefs questionnaire, known as EBQ. Turkish form has a three-factor structure unlike the original form. The first factor of the scale, "Belief that learning depends on effort (LDE)", consists of 18 items. The second factor, "Belief that learning depends on ability (LDa)", consists of 9 items. The third factor, "The belief that there is only one unchanging truth (OOCT)", consists of 8 items. The dual correlations between the factor scores of the scale show that factors are independent from each other, which means that the scale assesses different dimensions related to epistemological beliefs. Additionally, the low average scores of the factors were evaluated as non-developed epistemological belief and the high average scores were evaluated as developed beliefs on that sub-scale. The second instrument was a twenty-item- questionnaire on a five-point Likert scale (1, never or only rarely true of me, to 5, always or almost true of me) translated and adapted into Turkish by Batı, Tetik & Gürpınar (2010) from Biggs' Revised Two Factor Learning Approaches Scale (R-SPQ-2F), designed for tertiary-level students. Turkish form of R-SPQ-2F contains four sub-scales of five items each. Two sub-scales measure students' study motives (Surface, Deep), and the other two measure corresponding learning strategies utilised by students (Surface, Deep). The corresponding sub-scales for motive and strategy can be combined to produce a score representing approaches to learning – Surface and Deep (Range 10-50 for each sub-scale).

Data Analysis

The mean and standard deviation for each of the subscales of epistemological beliefs and learning approaches were obtained. The computed Pearson (r) correlation coefficient were used to determine whether there is a significant relationship among the subscales of epistemological beliefs and learning approaches. In order to understand the effect of gender, the level and the department of the students on epistemological beliefs and learning strategies ANOVA test was used. For all these statistical procedure, SPSS 19 for Windows was used.

4. Results

Characteristics of epistemological beliefs, study approaches, study motives and strategies

The mean and standard deviation of the three dimensions/sub-scales of epistemological beliefs, two study approaches, two study motives and corresponding strategies are listed in Table 1.

Table 1. The mean and standard deviation of epistemological belief, study approach, motive and strategy (N=632)

Dimension	Mean	SD	Alpha
Learning depends on effort	69,15	8,61	0,64
Learning depends on innate ability	19,72	4,74	0,77
The belief that there is only one unchanging truth	26,24	4,41	0,59
Surface Approach	28,87	5,52	0,72
Deep Approach	30,52	4,50	0,77
Surface Motive	13,52	3,59	0,58
Surface Strategy	15,34	2,75	0,60
Deep Motive	15,40	2,92	0,74
Deep Strategy	15,12	2,20	0,71

As illustrated by the sub-scale mean scores of the motives and strategies in Table 1, the relatively high mean score of the dimension LDE (Range 17-85) suggests that the students tend to believe that learning requires effort. The low mean score of the dimension LDA (Range 9- 45) suggest that students' belief in innate ability tend to lie at the lower end of the five-point scale, that is students tend not to believe learning is related to innate abilities. On the other hand, high mean score of the dimension OOCT (Range 8-40) suggests that the students also tend to believe that there is only one truth. Considering the results related to epistemological beliefs, Turkish teacher education students seemed to believe that learning depends mostly on effort although they also believe there is only one correct truth in some situations. As for study approaches, study motives and strategies, the total scale point should be between 10 and 50 for each factor. The mean sub-scale scores of the two study approaches were close to each other (see Table 1). Deep approach was slightly higher than surface approach and was just above 30, suggesting a relatively even use of the two approaches by the students, with some more students favouring a Deep Approach in their study. A similar pattern was found with the motives of students, but not in their strategies. The result suggests that students tend to be deep-oriented in their motives, but not in their strategies. In other words, they not only tend to perceive the task of learning as an external imposition but also they aim to understand the subject. They seem to look for meaning in the matter being studied and relating it to other experiences and ideas with a critical approach but in some contexts they seem to be keen on rote-learning and memorization.

Analysis of epistemological beliefs, study approaches, motives and strategies in different gender, the level of students and department they attend

Analysis of variance (ANOVA) showed no significant gender differences in epistemological beliefs For the gender groups, F=.730, df=628, $p > 0.01$ for LDA, F=.963, df=2, $p > 0.01$ for OOCT and F=.234, df=2, $p > 0.01$ for LDE. However, caution must be exercised in interpreting the result, as the analysis was limited by the comparatively fewer male participants in the sample. A wider gender-related sample would be necessary to confirm the gender effect on epistemological beliefs. As for level groups, the class of students was no significant effect on LDA (F=3,659, df=3, $p > 0.01$) and OOCK (F=.840, df=3, $p > 0.01$) but there was significant effect on LDE (F=.206, df=3, $p< 0.01$). The significance occurs between first class and third class students in accordance with the Tukey test results. It shows that students' tend to believe learning depends on effort through their education at university.

Table 2. The results of Tukey test related to epistemological beliefs of the participants from different levels

Independent Variable	I (grade)	J (Grade)	Mean Difference	SD	P
Deep Motivation	First Year	Third Year	-.96909	.31	.013

As for departments they attend there was no significant effect of department on LDE (F=1,198, df=5, p> 0,01), but there was significant effect of department on OOCK (F=8,217, df=5, $p < 0.01$and LDA (F=3.695, df=5, $p < 0.01$). In order to understand what causes that difference, Tukey test was applied to the statistical procedure (see Table 3).

Table 3. The results of Tukey test related to epistemological beliefs of the participants from different departments

Independent variable	I (department)	J (department)	Mean Difference (I-J)	SD	P
Learning depends on innate ability	English Language Teaching (ELT)	Primary school teaching	-1,85	.63	.045
		Science Teaching	-2,13	.60	.006
		Mathematics Teaching	-2,06	.58	.005
The belief that there is only one correct truth	Science Teaching	Primary school teaching	1,78	0,58	.029
		Mathematics Teaching	2,39	0,53	.000
		ELT	3,18	.55	.000
		Pre-school teaching	2,96	.64	.000

The results showed that the significance causes from ELT department in terms of the sub- scale LDA and from Science teaching department in terms of the sub-scale OOCT. Students from ELT department tend not to believe that learning depends on innate ability compared to the students from science teaching and mathematics teaching departments. On the other hand, students form science teaching department tend to believe "there is only one correct truth" more than the students from primary school teaching, mathematics teaching, ELT and Pre-school teaching. ANOVA showed no significant gender differences in learning approaches except in the dimension Surface Motive (female: N = 144, mean=13.32, SD = 3.51; male: N = 144, mean = 14.18, SD = 3.75, $F = 3.041$, $p<.001$). Female students have lower opinion about surface motivation than male students. Once again, the relevance of the result was limited by the limited number of male participants in the analysis. ANOVA study also showed that there is no significant effect of the level of students on deep strategy and surface strategy but there is significant effect on deep motivation (F=4.055, df=3, $p < 0.01$), surface motivation (F= 1,605 df=3, $p<0.01$), deep approach (F= . 778, df=3, $p<0.01$) and surface approach (F=5.562, df= 3, $p<0.01$). In order to understand what causes that difference, Tukey test was applied to statistical procedure. The results showed that as students progress through university, they become more intrinsically motivated. The results also show that students become deep-oriented in their learning approaches and motives but not in strategies as they progress through university (see Table 4).

Table 4. The results of Tukey test related to learning approaches of the participants from different levels

Independent Variable	I (grade)	J (Grade)	Mean Difference	SD	P
Deep Motivation	First Year	Third Year	-.96909	.31	.013
		Fourth Year	-.91217	.32	.024
Surface Motivation	First Year	Third year	1,22510	.35	.003
		Fourth year	1,40058	.35	.001
Deep Approach	First Year	Third Year	-1,45709	.49	.017
		Fourth Year	-1,30409	.49	.044
Surface Approach	First year	Third Year	1,56970	.47	.006
		Fourth Year	1,67051	.48	.003

As for departments of students, there was no significant effect of the departments on their surface strategy (F=2.10, df=5, p>0.01), deep motive (F= 1.215, df=5, p> 0.01) and deep approach (F=2.269, df=5, p>0.01) but effect on deep strategy (F=3.612, df=5, p<0.01), surface motive (F=3.158, df=5, p<.0.01) and surface approach (F= 3.950, df=5, p<0.01) (see Table 5).

Table 5 The results of Tukey test related to epistemological beliefs of the participants from different departments

Independent variable	I (department)	J (department)	Mean Difference (I-J)	SD	p
Deep Strategy	ELT	Mathematics Teaching	1.02	.26	.002
Surface Motive	Mathematics Teaching	ELT	1,99	.40	.000
Surface Approach	Mathematics Teaching	ELT	2.82	.53	.000
		Turkish Language Teaching	2.30	.60	.006

As indicated in Table 5, the major difference is between students from ELT department and mathematics teaching. Students from ELT department tend to be more deep-oriented in their learning strategies and motives than the students from mathematics teaching. Students from mathematics teaching are also more surface-oriented in their motives compared to students from pre-school teaching and more surface-oriented in their learning approaches compared to the students from Turkish language teaching.

Relations between epistemological beliefs and study approaches, study motives and strategies

Table 6 shows the Pearson correlation coefficients of each possible pairing of one of the two study approach constructs and one of the three dimensions of epistemological belief and levels of significance.

Table 6. Correlations between epistemological belief and study approach, study motives and study strategies

	Dimensions of Epistemological beliefs		
Dimensions of Study Approach, study motive and study strategies	**Learning depends on innate ability**	**Learning depends on effort**	**The belief that there is only one correct truth**
Surface Approach	**. 292****	-.066	**.158****
Deep Approach	**-.124 ****	**. 253****	.080
Surface Motive	**.287****	**-.126****	**.097***
Surface Strategy	**.211****	.032	**.191****
Deep Motive	**-.136****	**.245****	.080
Deep Strategy	-.074	**.192****	.074

* Significant at the 0.05 level (two-tailed). ** Significant at the 0.01 level (two-tailed). *** Significant at the 0.001 level (two-tailed).

The three dimensions of epistemological belief were found to be significantly related to the two study approaches at the 0.05, 0.01 and 0.001 levels. The dimension LDA was found to be negatively related to Deep Approach and Deep Motive but positively related to Surface Approach, Surface Motive and Surface Strategy but bears no relation to Deep Strategy. The dimension LDE was found to be positively related to Deep Approach, Deep Motive and Deep strategy and negatively related to Surface Motive but bears no relation to Surface Approach and Surface Strategy The dimension OOCT was found to be positively related to Surface Approach, Surface Strategy and Surface Motive but bears no relation to Deep Approach, Deep Motive and Deep Strategy. That is, students who tend to believe LDA were likely to be surface motivated and to utilize a surface strategy in their learning. Students who tend to believe LDE would be deep-motivated and adopt a deep study strategy. The results also showed that the students who tend to believe OOCT are more surface oriented in their motives and strategies.

5. Discussion and Recommendations

Considering the results related to epistemological beliefs, there was no statistically significant difference in epistemological beliefs across gender groups, suggesting that students' epistemological beliefs are independent of gender as also found in a study conducted by Chan (2007). However, there was significant difference of level of students on learning depends on effort. That is, their epistemological beliefs become more sophisticated through their education. The results support the idea of Schommer (1998) who suggests that the higher the educational level

achieved by adults, the more likely they are to believe that knowledge is constantly evolving and highly complex. The study also shows that students from science teaching have tendency to believe there is only one unchanging truth rather than the other departments; on the other hand students from ELT department have less tendency to believe learning depends on innate ability rather than the other students from other departments. The results of the study is not supported by Gürol, Altunbaş &Karaaslan (2010) who found that there is statistically significance between gender but no difference on the departments of the students but is supported by Eroğlu & Güven who found that there is statistically significance between different levels of students on the idea of learning depends on effort.

The sub-scale scores of the study approaches, the motive and strategy components of the teacher education students in this study indicate that students tend to be surface at the beginning of their education but deep-oriented as they progress through education which is also stated by Hayes et al. (1997) who suggest that it is generally held that the development of a deep approach is consistent with the avowed aims of higher education The study also showed no significant differences at either 0.05 or 0.01 level for gender. The results imply that, in general, gender types have no or little influence on the study approaches, motives and strategies of students. However, the level and departments of students have influence on study approaches, motives and strategies of students. In a study with Hong Kong teacher education students conducted by Chan (2007) also found that the study approaches, motives and strategies utilized by the Hong Kong teacher education students are independent of gender but dependent on level of students. Both these studies imply that as students grow older they tend to rely on the process of understanding rather than mere memorisation of facts, a favourable phenomenon that should be encouraged.

Pearson correlation analysis shows that epistemological beliefs are related to learning approaches, motives and strategies as also stated by Rodriguez & Cano (2006) who suggest that participants who deployed a Surface approach showed more naive beliefs than those participants who deployed Deep approach demonstrating more mature or sophisticated beliefs about knowledge and learning. This study therefore lends support to suggestions in the research literature that epistemological beliefs are related to metacognitive activities, as mentioned in Schommer' study (1994). The results also lend support to the findings of researchers such as Hofer (1994), Schultz *et al.* (1993) and Paulsen and Feldman (1999) regarding the significant relationship between the epistemological beliefs of students and their motivation to learn on a particular course of study. In addition to the motivation aspect, this study also elaborates the significant relations between epistemological beliefs and students' utilized strategies and hence their study approaches. For example, students who believe that learning requires effort and the process of understanding would probably try to learn with a deep motive and strategy rather than relying on rote learning, accounting for a deep approach being adopted instead of a surface one.

Through uncovering the epistemological beliefs held by students, this study enables schoolteachers and students themselves to understand the approaches, motives and strategies utilized in learning. It follows that one of the possible means of changing the study approaches, motives and strategies utilized by students in their learning would be to alter the epistemological beliefs they hold, which are influenced by their previous experience and learning contexts. Caution must be noted that the Pearson correlation analysis is a correlational study and no causal effect relationship is shown by the analysis. Structural Equation Modelling, helps to illustrate the relationships among these variables. It should be also considered that this study relies on self-reporting measures and the participants from only one university. There is scope for future research to investigate relationships, collecting data from different universities and using additional types of measures (e.g. structured interviews). In spite of these limitations, taken together, these results show how students' ways of going about learning on courses or curricula are interrelated with the beliefs they hold about learning and knowledge. Teachers could make use of the findings of these studies to improve the effectiveness of classroom teaching and learning. It should be remembered that the findings of this study refer to a group of Turkish teacher education students, and cultural contextual differences must be taken into account on analysis of parallel studies.

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